UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

August 2, 2000

Sonny J. O'Neal
Forest Supervisor
United States Department of Agriculture
Forest Service
215 Melody Lane
Wenatchee, Washington 98801

Re: Biological Opinion for the Early Winters and Willis Irrigation Ditches (WSB-98-050)

Dear Mr. O'Neal:

This document transmits the National Marine Fisheries Service's (NMFS) biological opinion (BO) for the reinstatement of a special use permit to the Early Winters Ditch Company for the continuing operation of their surface water diversion(s) from Early Winters Creek, a tributary to the Methow River, Okanogan County, Washington. This BO analyzes the effects of the proposed action to the endangered Upper Columbia River steelhead (*Oncorhynchus mykiss*) and the endangered Upper Columbia River spring chinook salmon (*O. tshawytscha*), and their designated critical habitats, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). Formal consultation was formally initiated on September 16, 1999.

This biological opinion is based on information provided in a biological assessment (BA) dated August 7, 1998, and subsequent amendments to the BA that completed the informational needs to complete formal consultation. A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office.

The Forest Service has determined that the proposed project is likely to adversely affect the above listed species, but would not jeopardize the continued existence of the species or result in the destruction or adverse modification of their critical habitats.

The enclosed document represents NMFS' biological opinion on the above listed species in accordance with section 7 of the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 *et seq.*).

In your review of the BO, please note the incidental take statement, which includes reasonable and prudent measures and terms and conditions to avoid and minimize take and avoid jeopardy. Also, please note that we have included conservation recommendations.

Should you have any questions, please contact Dennis Carlson at (360) 753-5828.

Sincerely,

Russell M. Strach for

William W. Stelle, Jr.
Regional Administrator

Enclosure:

cc: Steven W. Landino, NMFS Washington State Habitat Branch Chief

ENDANGERED SPECIES ACT - SECTION 7

BIOLOGICAL OPINION

EARLY WINTERS AND WILLIS IRRIGATION DITCHES
Okanogan National Forest

WSB-98-050

Agency: National Marine Fisheries Service

Consultation
Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch Office

Approved _____ Date August 2, 2000

William W. Stelle, Jr.
Regional Administrator

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I. CONSULTATION HISTORY

The U.S. Department of Agriculture, Okanogan National Forest, Methow Valley Ranger District, has requested Endangered Species Act (ESA) section 7 consultation with the National Marine Fisheries Service (NMFS), Washington State Habitat Branch, for the proposed reinstatement of a special use permit to convey water in the Early Winters and Willis irrigation ditches across U.S. Forest Service (USFS) managed land in the Okanogan National Forest near Winthrop, Okanogan County, Washington. A chronology of project events follows:

- On August 3, 1998, a Level 1 Team meeting comprised of representatives from the USFS, U.S. Fish and Wildlife Service and NMFS was convened to discuss the proposal;

- On August 28, 1998, the USFS submitted a written request, along with a biological assessment (BA) dated August 7, 1998, to initiate formal section 7 consultation with NMFS;

- On April 2, 1999, the USFS submitted additional information from the Early Winters Ditch Company to NMFS regarding proposed structural improvements to the ditch and its operation;

- On June 14 and 17, 1999, the USFS submitted additional stream flow information about Early Winters Creek; and,

- On September 16, 1999, NMFS received from the USFS a draft proposal by the Early Winters Ditch Company to maintain the diversion structure and side channel in Early Winters Creek.

The September 16 submittal completed the information necessary for NMFS to conduct the consultation and the date of initiation for formal consultation is September 16, 1999. On January 24, 2000, NMFS received additional flow data and a Draft Operational Plan from Ogden Murphy Wallace, on behalf of the Early Winters Ditch Company, for the operation of the Early Winters Ditch for year 2000 and beyond. The objective of the draft plan is to use science to protect resident and anadromous fish and their habitat in Early Winters Creek while allowing continued use of the current irrigation system consistent with their water rights. The plan also includes a proposal for using deep-water wells to supply irrigation water instead of using surface water diversions before seasonal low baseflow conditions are reached in Early Winters Creek. By a telephone conversation between Dennis Carlson (NMFS) and Terry O'Reilly (Early Winters Ditch Company President) on March 23, 2000, it was confirmed that the Draft Operational Plan for 2000 would be implemented. On June 22, 2000, the Early Winters Ditch Company submitted their Year 2000 Operation Plan that contains an agreement with the USFS to modify surface diversions to maintain 35 cubic feet per second (cfs) of instream flow in Early Winters Creek, as measured at the gauge located at the State Route 20 crossing approximately at river mile (RM) 0.25.

The objective of this biological opinion (BO) is to determine whether the proposed action is likely to jeopardize the continued existence of the endangered Upper Columbia River steelhead trout (*Oncorhynchus mykiss*) or the Upper Columbia River spring chinook salmon (*O. tshawytscha*), or result in the destruction or adverse modification of designated critical habitats. The NMFS has reviewed the following information to reach its determination and prepare this BO:

- The available BA, amendments, maps, USFS' "1999 Operation and Maintenance Plan," flow data provided by the applicant, Washington State Department of Ecology (WDOE), and Washington State Department of Fish and Wildlife (WDFW) and WDFW's "1998 Pre-Irrigation Season Fish Screen Maintenance; Fish Bypass Operation Procedure," and associated attachments;

- Telephone and/or FAX communications conducted by Dennis Carlson and Mike Grady of NMFS with Jennifer Molesworth, Mel Bennett and Bill Baer of the USFS, Brad Caldwell of Washington Department of Ecology (WDOE), Hal Beecher of Washington Department of Fish and Wildlife (WDFW), Bob Anderson of Golder Associates Inc., and Steve Devin and Terry O'Reilly of the Early Winters Ditch Company;

- Reference materials that include Early Winters watershed analysis, the "Methow River Basin Fish Habitat Analysis Using the In Stream Flow Incremental Methodology," Federal Register Notices, the "1992 Washington State Salmon and Steelhead Stock Inventory, Appendix Three, Columbia River Stocks," "Production and habitat of salmonids in Mid-Columbia River tributary streams by Mullan et al.," "NMFS Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California," "An Ecosystem Approach to Salmonid Conservation," the "NMFS Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California," and 1999 Early Winters Creek flow data compiled by Golder Associates Inc.

- Comments received on the Draft BO (July 8, 1999) from the USFS; the law firm of McQuaid, Metzler, Bedford, and Van Zant; and Peter Morrison of the Pacific Biodiversity Institute.

II. DESCRIPTION OF PROPOSED ACTION

A. Early Winters Ditch

The USFS has management authority over national forest lands and grants permits for water conveyance across managed lands to people with valid water rights. The proposed action is to reinstate a special use permit issued to Early Winters Ditch Company by the USFS to allow the conveyance of water across National Forest lands for irrigation purposes. The permit was renewed on April 15, 1998, and expires on December 31, 2006.

The Early Winters Ditch water right claim dates back to August 1907. The claim is for 60 cfs, with 15 cfs being claimed as actual diversion in 1974. The claim allows Early Winters to begin diversion on April 1 each year and continue until November 1. The 1974 claim was for 633 acres, of which 428 acres were irrigated that year. The water is used to irrigate hay and alfalfa fields, pastures, stock watering, fire protection, and lawn and garden uses.

The Early Winters Ditch removes water from Early Winters Creek about 0.5 mile above the confluence of the creek with the Methow River, directly across from the Early Winters Creek Campground. The ditch occupies a strip of USFS land that is approximately 2,640 ft. long and 20 ft. wide. The headgate and a 100 ft.- long side channel used to divert water to the headgate are also on USFS land. The headgate occupies about 2,500 square ft. of land that is allocated within the Riparian Reserve of Early Winters Creek. After the headgate works the ditch leaves the Riparian Reserve and leaves the Early Winters watershed. The total ditch length is about 5 miles.

The State of Washington installed a fish screen in 1952. An additional bay and drum was added in 1966. The headgate and screen are of an old design and are on the WDFW replacement list by the fall of 2000. Until the headgate is replaced and the WDFW replaces the fish screen, WDFW had instructed Early Winters Ditch Company to place boards on the downstream side of the screen to slow the approach velocity of water flowing into the upstream side of the screen. This prevents fish from getting strained through the mesh or riding over the top into the ditch, and allows fish to swim away from the screen and into a return pipe back into the creek. Funding has been procured to replace the existing fish screen by the fall of 2000.

A detailed description of proposed structural improvements to the existing headgate and fish screen and operation of the Early Winters Ditch is provided in the BA, and supplemental BAs, with mitigation and monitoring measures outlined in the Early Winters Ditch Company's letter to the USFS for ditch operation in 2000, and the Final 2000 Operating Plan prepared by Golder Associates Inc. and the Early Winters Ditch Company. A summary of that proposed work follows.

The Early Winters headgate is located on Early Winters Creek on National Forest land at about RM 0.5 upstream from its confluence with the Methow River, on the west bank (looking

downstream). The diversion structure is at the extreme southern margin of an active alluvial fan, a depositional feature built through a process of channel migration and/or avulsion. Water is presently diverted to the headgate by a 100 ft.- long side channel maintained by the ditch company. Until being washed out during a 1997 flood, a large log dam cabled in place in Early Winters Creek had diverted water to the side channel. Since then the ditch company has periodically needed to maintain flow to the headgate by excavating cobble and gravel material from the side channel.

The original BA contained a proposal to perform in-channel structural work comprised of three main elements that included: 1) the use of a partial weir, constructed of large rock, to replace the existing wooden weir; 2) installation of a large woody debris structure at the upstream apex of the island; and, 3) placing an additional woody debris structure in the channel that bisects the island to direct flows to the headgate. They had also proposed to dredge the side channel to maintain flow to the headgate. The proposal to construct a rock weir is no longer required because of an in-channel habitat restoration project implemented by the Pacific Watershed Institute (PWI) in Early Winters Creek in the vicinity of the ditch headgate in November 1999. PWI also installed large woody debris at the upstream apex of the "island" in the stream channel adjacent to the ditch headgate. They also augmented an existing logjam in the main flow channel by placing additional large wood. That project work was implemented through a section 7(d) determination by the USFS in October 1999. There is no longer a need to perform the proposed in-channel modifications requested in the original BA, including the side channel dredging, and that work has been removed from further consideration in this consultation, as per a telephone conversation conducted between Dennis Carlson of NMFS and Jennifer Molesworth of the USFS on March 21, 2000 and in telephone conversations with Dennis Carlson, Terry O'Reilly and Steve Devin of the EarlyWinters Ditch Company on March 23, 2000.

The Early Winters Ditch Company proposes to divert up to 14 cfs for irrigation purposes, although they have a claim for 60 cfs. They undertook a study in 1999 (Golder Associates Inc.) to collect information on water use, conveyance loss, and flows with the objective of designing a long-term solution to a replacement fish screen, headgate works repairs, and pipe and ditch maintenance items already identified as prone to failure. The Early Winters Ditch Company also installed a Cipolleti weir to monitor actual ditch flows (Final 2000 Operation Plan).

A major component of the Final 2000 Operation Plan is an agreement with the USFS by the Early Winters Ditch Company to modify diversion operations to maintain 35 cfs in Early Winters Creek. During an interagency meeting conducted on February 3, 2000 with Terry O'Reilly and Steve Devin of the Early Winters Ditch Company, Bob Anderson of Golder Associates Inc., Brad Caldwell of WDOE, Hal Beecher of WDFW, Jodi Bush of U.S. Fish and Wildlife Service, and Mike Grady and Dennis Carlson of NMFS, it was proposed that a minimum instream flow of 35 cfs would be maintained. The same proposal was discussed at a February 11, 2000 meeting at the USFS office in Winthrop with Greg Knott of the USFS, Mike Grady and Dennis Carlson, and Terry O'Reilly and Steve Devin. A subsequent meeting on June 22, 2000 at the same location attended by Mike Grady, Greg Knott, Steve Devin, Terry O'Reilly, and Ken Brown and Roger

Townsend of the Early Winters Ditch Company, resulted in an agreement between the USFS and the Early Winters Ditch Company to modify diversion operations to maintain at least 35 cfs in Early Winters Creek, as measured at the State Route 20 bridge crossing, or to cease or delay operations when 35 cfs cannot be maintained. Surface water diversion would be replaced or augmented by groundwater withdrawals (i.e., well water) when necessary. Early Winters Ditch Company has applied to the Washington State Department of Ecology for a change in point of diversion and intends to use deep-water wells. The agreement is summarized in the Special Use Permit in the Operation and Maintenance Plan for the Early Winters Ditch. The Forest Service did not submit a new BA analyzing the effects of the modified proposed action.

B. Willis Ditch

The proposed action also includes a request to reinstate a special use permit by the USFS to allow the conveyance of water across National Forest lands for irrigation purposes. The permit was renewed in the spring of 1998 and expires on December 31, 2006.

The Willis Ditch is located on the left bank about 1.25 miles above the confluence of Early Winters Creek and the Methow River. It diverts about 1.7 cfs from Early Winters Creek. The water is used by Arrowleaf Resort. The diversion structure is made of cobble and small boulders and does not block fish migration. This ditch diverts a small portion (<5%) of the average low flow condition in Early Winters Creek and it is intended that use of this surface water diversion would cease in 2000 if Arrowleaf receives permission from WDOE to install a well.

The Willis Ditch special use renewal is pending a lawsuit filed in the State Supreme Court against Arrowleaf Resort by the Okanogan Wilderness League on water right issues. The Arrowleaf Resort had been working with the WDOE to obtain a change in the point of diversion of the Willis water right from stream removal to a well. That is projected to occur sometime in 2000. If a settlement agreement is reached the Willis Ditch will be permanently abandoned and the special use permit will no longer be needed. That water quantity would then be left for instream uses.[1] A new fish screen was installed in 1994. The diversion structure in Early Winters Creek is loosely made of cobble and small boulders and does not block fish migration.

[1] Although NMFS understands that this lawsuit has been settled and that Willis Ditch has been abandoned, the BA has not been amended to delete the Willis Ditch permit. Accordingly, NMFS assumes that reinstatement of the Willis Ditch permit remains part of the proposed action.

C. Action Area

The term "action area" means "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." (50 C.F.R. § 402.02.) The action area for this consultation is Early Winters Creek, starting at the Willis Ditch diversion at RM 1.25 and proceeding downstream. The Early Winters Ditch headworks are at RM 0.5. The action area extends some distance down the Methow River from the confluence of Early Winters Creek with the Methow, at RM 67.3. The precise downstream limit of the action area cannot be easily determined because the extent of indirect effects of the proposed action on Methow River flows vary according to flow stage. Early Winters Creek has flow measuring gauges at the Highway 20 bridge crossing (below the diversion), at the Early Winters diversion (Cipolleti weir), and one immediately upstream of the headgate, just upstream of the PWI in-channel restoration work.

III. STATUS OF LISTED SPECIES AND BIOLOGICIAL REQUIREMENTS

A. Upper Columbia River Steelhead

Upper Columbia River steelhead were listed as endangered species under the ESA on August 18, 1997 (62 Fed. Reg. 43937). Critical habitat for the Upper Columbia River steelhead was designated on February 16, 2000 (65 Fed. Reg. 7764). The listing status, biological information, and other information for the Upper Columbia River steelhead are further described in Attachment 1.

Range-wide factors for the decline of west coast steelhead stocks are primarily attributed to the destruction and modification of habitat, over-utilization for recreational purposes, and natural and human-made factors (NMFS 1996a, 1996b, 1997). Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (including the Columbia River Basin) have greatly reduced or eliminated historically accessible habitat. Studies estimate that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded (Gregory & Bisson 1997). Washington's and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91 percent loss of its wetland habitat (NRC 1996).

Loss of habitat complexity has also contributed to the range-wide decline of steelhead. In portions of some national forests in Washington, there has been a 58 percent reduction in large deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood (McIntosh et al. 1994). Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west-coast steelhead (62 Fed. Reg. 43942).

Steelhead support an important recreational fishery throughout their range. During periods of decreased habitat availability (e.g., drought conditions or summer low flow when fish are

concentrated), the impacts of recreational fishing on native anadromous stocks may be heightened (62 Fed. Reg. 43942). Steelhead are not generally targeted in high seas commercial fisheries; however, listed steelhead from the Upper Columbia and Snake River Evolutionarily Significant Units (ESUs) migrate at the same time and are subject to the same fisheries as unlisted, hatchery-produced steelhead, chinook and coho salmon in the Columbia River.

Steelhead of this listed ESU that may be adversely affected by the proposed action are present in Early Winters Creek, a tributary to the Methow River. The Upper Columbia River Basin steelhead ESU occupies the Columbia River Basin upstream from the confluence with the Yakima River, Washington, to the United States - Canada border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion (Omernik 1987). Early Winters Creek is in the Okanogan Highlands Physiographic Province. The river valleys in this region are deeply dissected and maintain low gradients except in extreme headwaters. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers.

The proposed action would occur within designated critical habitat for Upper Columbia River steelhead. Defining specific river reaches that are critical for steelhead is difficult because of the low abundance of the species and of our imperfect understanding of the species' freshwater distribution, both current and historical (1933 - 1959) (65 Fed.Reg. 7764; February 16, 2000). Based on consideration of the best available information regarding the species' current distribution, NMFS believes that the preferred approach to identifying critical habitat for steelhead is to designate all areas accessible to the species within the range of specified river basins in this ESU (65 Fed Reg. 7764; February 16, 2000).

Essential features of steelhead critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. Good summaries of the environmental parameters and freshwater factors that have contributed to the decline of steelhead can be found in reviews by Barnhart (1986); Pauley *et al.*, (1986); California Advisory Committee on Salmon and Steelhead Trout (CACSST) (1988); Brown and Moyle (1991); Bjornn and Reiser (1991); Higgins *et al.*, (1992); Nehlsen *et al.*, (1991); California State Lands Commission (1993): Reynolds *et al.*, (1993); Botkin *et al.*, (1995); McEwan and Jackson (1996); NMFS (1996); NMFS (1996a, 1996b, 1997); and Spence *et al.*, (1996).

Estimates of historical (pre-1960s) steelhead abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size in excess of 5,000 adults for tributaries above Rock Island Dam (Chapman *et al.*, 1994). Recent five-year (1989-1993) average natural escapements for the Methow and Okanogan Rivers were 450 steelhead. Recent average total escapements for this stock were 2,400. Average total run size at Priest Rapids Dam for the same period was approximately 9,600 adult steelhead (62 Fed. Reg. 43949; August 18, 1997). Hatchery programs

and harvest management have strongly influenced steelhead populations in the Upper Columbia River Basin ESU. Hatchery programs intended to compensate for habitat losses have masked declines in natural stocks and have created unrealistic expectations for fisheries (62 Fed. Reg. 43944; August 18, 1997). Collection of natural steelhead for broodstock and transfers of stocks within and between ESUs has detrimentally impacted some populations (62 Fed. Reg. 43944; August 18, 1997).

Trends in total (natural and hatchery) adult escapement for the Methow and Okanogan Rivers combined show a 12 percent annual decline from 1982-1993 (NMFS 1996a, 1996b; August 18, 1997). This stock, plus the Wenatchee River stock, represent most of the escapement to natural spawning habitat within the range of the ESU (62 Fed. Reg. 43949; August 18, 1997).

Steelhead in the Upper Columbia River ESU continue to exhibit low abundances, both in absolute numbers and in relation to numbers of hatchery fish throughout the region. Review of the most recent data indicates that natural steelhead abundance has declined or remained low and relatively constant in the major river basins in this ESU (Wenatchee, Methow, Okanogan) since the early 1990s (NMFS 1996a, 1996b, 1997). Estimates of natural production of steelhead in the ESU are well below replacement (approximately 0.3:1 adult replacement ratios estimated in the Wenatchee and Entiat Rivers) (62 Fed. Reg. 43949; August 18, 1997). These data indicate that natural steelhead populations in the Upper Columbia River Basin are not self-sustaining at the present time. There is also anecdotal evidence that resident rainbow trout contribute to anadromous run abundance. This phenomenon would reduce estimates of the natural steelhead replacement ratio (62 Fed. Reg. 43949; August 18, 1997).

The proportion of hatchery fish is high in these rivers (65-80%). Substantial genetic mixing of populations within this ESU has occurred, both historically as a result of the Grand Coulee Fish Maintenance Project (GCFMP) and more recently as a result of the Wells Hatchery program. Extensive mixing of hatchery stocks throughout this ESU, along with the reduced opportunity for maintenance of locally adapted genetic lineages among different drainages, represents a considerable threat to steelhead in this region (62 Fed.Reg. 43949; August 18, 1997).

The primary cause for concern for steelhead in this ESU is the extremely low estimate of adult replacement rate. The dramatic declines in natural run sizes and inability of naturally spawning steelhead adults to replace themselves suggest that if present trends continue, this ESU will not be viable (62 Fed. Reg. 43950; August 18, 1997).

Steelhead and rainbow trout are found throughout the lower 7.5 miles of Early Winters Creek. A natural falls at RM 7.5 is a fish passage barrier. Rainbow/steelhead trout collected in Early Winters Creek are good examples of interior redband rainbow trout and show little influence from stocking (Proebstel, 1996). Hybrid rainbow/cutthroat trout are also found in lower Early Winters Creek. Habitat conditions for steelhead are excellent in Early Winters Creek. It is likely that steelhead spawn in Early Winters Creek and good spawning habitat can be found in places throughout the lower 7.5 miles of the creek (USFS 1998). Adult steelhead tend to migrate up the Methow River and its tributaries during spring when water flows are high and turbid, making it

difficult to make visual observations of adults or their redds.

Juvenile steelhead are known to occur in the immediate vicinity of the Early Winters Ditch headgate and in the project action area. An August 11, 1993 electroshock survey conducted in a 100 ft. section of the Early Winters Ditch downstream of the fish screen found 3 juvenile steelhead/rainbow trout[2] (USFS 1998). Fish that enter the Early Winters Ditch through or over the existing screen are not able to return to the creek and would eventually die when the ditch is shut off at the end of the irrigation season.

Early Winters Creek also provides an important refuge for juvenile steelhead during late summer/fall low baseflow conditions. The Methow River naturally goes subsurface during late summer and into winter in most years from the Lost River downstream to just above the Weeman Bridge, a distance of 8-11 miles (USFS 1998). Early Winters Creek provides watered habitat during those times. In addition, redds placed in Early Winters Creek are less likely to be dewatered than redds placed in the adjacent reach of the Methow River, and while fewer redds may be found in Early Winters Creek, they may be more likely to produce fish (USFS 1998).

B. Upper Columbia River Spring Chinook Salmon

The Upper Columbia River chinook salmon were listed as endangered pursuant to the ESA on March 24, 1999 (64 Fed Reg. 14308). Critical habitat for the Upper Columbia River spring chinook salmon was designated on February 16, 2000 (65 Fed. Reg. 7764). The listing status, biological information, and other information for the Upper Columbia River spring chinook salmon are further described in Attachment 2.

The species status reviews (NMFS 1998a, 1998b) cited references indicating that habitat degradation is the major cause for the range-wide decline in west coast chinook salmon stocks. Habitat alterations that have affected chinook salmon include water withdrawal, conveyance, storage, flood control (resulting in insufficient flows, stranding, juvenile entrainment, and increased stream temperatures), logging and agriculture (resulting in loss of large woody debris, sedimentation, loss of riparian vegetation, and habitat simplification) (Spence *et al.*, 1996; NMFS 1998a). Dams, mining and urbanization have also contributed to the partial depletion or extinction of certain chinook salmon stocks.

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[2]Under certain conditions, anadromous and resident *O. mykiss* are apparently capable not only on interbreeding, but also of having offspring that express the alternate life history form, that is, anadromous fish can produce nonanadromous offspring, and vice versa (NMFS 1996a). Mullan *et al.* (1992) found evidence that, in very cold streams, juvenile steelhead had difficulty attaining "mean threshold size for smoltification" and concluded that "Most fish here (Methow River, Washington) that do not emigrate downstream early in life are thermally-fated to a resident life history regardless of whether they were progeny of anadromous or resident parents."

Other range-wide factors that impact indigenous west coast chinook salmon stocks include introduced or artificially propagated hatchery stock, commercial harvest, alteration of estuarine habitat, and natural fluctuations in marine environments (Healy 1991, NMFS 1998a, 1998b).

Spring chinook salmon of this listed ESU that may be adversely affected by the proposed action are present in Early Winters Creek, a tributary to the Methow River. The Upper Columbia River spring chinook salmon ESU occupies the Columbia River Basin upstream from Rock Island Dam to the United States - Canada border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion (Omernik 1987). Early Winters Creek is located in the Okanogan Highlands Physiographic Province, and includes stream-type chinook salmon that spawn upstream of the Rock Island Dam in the Wenatchee, Entiat, and Methow Rivers and their tributaries. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers.

The proposed action would occur within designated critical habitat for the Upper Columbia River spring chinook salmon. Defining specific river reaches that are critical for spring chinook salmon is difficult because of the current low abundance of the species and of our imperfect understanding of the species' freshwater distribution, both current and historical (65 Fed. Reg. 7764; February 16, 2000).

Based on consideration of the best available information regarding the species' current distribution, NMFS believes that the preferred approach to identifying the freshwater and estuarine portion of critical habitat is to designate all areas (and their adjacent riparian zones) accessible to the species within the range of each ESU (65 Fed. Reg. 7764; February 16, 2000).

NMFS believes that adopting a more inclusive, watershed-based description of critical habitat is appropriate because it (1) recognizes the species' use of diverse habitats and underscores the need to account for all of the habitat types supporting the species' freshwater and estuarine life stages, from small headwater streams to migration corridors and estuarine rearing areas; (2) takes into account the natural variability in habitat use (e.g., some streams may have fish present only in years with plentiful rainfall) that makes precise mapping difficult; and (3) reinforces the important linkage between aquatic areas and adjacent riparian/upslope areas (65 Fed. Reg. 7764; February 16, 2000).

Essential features of spring chinook salmon critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space and safe passage conditions. Good summaries of these environmental parameters and freshwater factors that have contributed to the decline of spring chinook salmon and other salmonids can be found in reviews by CACSS, 1988; Brown and Moyle, 1991; Bjornn and Reiser, 1991; Nehlsen *et al.*, 1991; Higgins *et al.*, 1992; California State Lands Commission (CSLC), 1993; Botkin *et al.*, 1995; NMFS, 1996; NMFS 1998a and 1998b; and Spence *et al.*, 1996.

Upper Columbia River spring chinook, like steelhead in this ESU, have had a substantial portion of historical habitat blocked by Chief Joseph and Grand Coulee Dams on the mainstem Columbia River (NMFS 1998a, 1998b). There are local habitat problems related to irrigation diversions and hydroelectric development, as well as degraded riparian and instream habitat from urbanization and livestock grazing (65 Fed. Reg. 7764; February 16, 2000).

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU, either through hatchery-based enhancement or the extensive trapping and transportation activities associated with the GCFMP (65 Fed. Reg. 7764; February 16, 2000). Prior to the implementation of the GCFMP, spring-run chinook salmon populations in the Wenatchee, Entiat, and Methow rivers were at severely depressed levels (Craig and Suomela, 1941). Therefore, it is probable that the majority of returning spring-run adults trapped at Rock Island Dam for use in the GCFMP were probably not native to these three rivers (Chapman *et al.*, 1995). All returning adults were either directly transported or spawned in one of the National Fish Hatcheries built for the GCFMP.

In the years following the GCFMP, several stocks were transferred to the hatcheries in this area. Naturally spawning populations in tributaries upstream of hatchery release sites have apparently undergone limited introgression by hatchery stocks, based on coded wire tag recoveries and genetic analysis (Chapman *et al.*, 1995). Artificial propagation efforts have recently focused on supplementing naturally spawning populations in this ESU (Bugert, 1998), although it should be emphasized that these naturally spawning populations were founded by the same GCFMP homogenized stock. Furthermore, the potential for hatchery-derived non-native stocks to genetically impact naturally spawning populations exists, especially given the recent low numbers of fish returning to rivers in this ESU (65 Fed. Reg. 7764; February 16, 2000).

Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Nehlsen *et al.*, (1991) identified six stocks as extinct. Washington Department of Fisheries *et al.*, (1993) considered nine stocks within the ESU, of which eight were considered to be of native origin and predominantly natural production. The status of all nine stocks was considered depressed. Populations in this ESU have experienced record low returns for the last few years (65 Fed. Reg. 7764; February 16, 2000).

Recent total abundance of the Upper Columbia River spring chinook salmon ESU is quite low, and escapements in 1994-1996 were the lowest in at least 60 years (65 Fed. Reg. 7764; February 16, 2000). At least 6 populations of spring chinook salmon in this ESU have become extirpated and almost all remaining naturally-spawning populations have fewer than 100 spawners (65 Fed. Reg. 7764; February 16, 2000). In addition to extremely small population sizes, both recent and long-term trends in abundance are downward, some extremely so. The Washington State Salmon and Steelhead Stock Inventory (SASSI, 1992) lists the Methow River spring chinook production as declining, based on a long-term negative trend in escapement. Stock performance over the past decade however would put them at the head of the “critical” class as defined in the SASSI.

Spring chinook spawning has been observed in some smaller tributaries including Early Winters, Gold, Lake, and Wolf Creeks. Methow River spring chinook are depressed based on a long-term negative trend in escapement. The largest densities of spring chinook redds that occur in the Methow River are from about RM 57 to RM 67, below the confluence of Early Winters Creek with the Methow. Spring chinook have been observed spawning in Early Winters Creek since 1987 (Caldwell and Catterson, 1992). However, the fish and redd counts have dropped dramatically and steadily from 1987 to 1991 (Caldwell and Catterson, 1992). In 1991, no spring chinook redds were counted in Early Winters Creek and the count of spring chinook that migrate over Wells Dam was the lowest on record (since 1967) (Caldwell and Catterson, 1992).

Winter conditions are harsh in this watershed: ice-free areas and known warmer groundwater areas are limited. Tributaries with flows, such as Early Winters Creek at RM 67.3, may provide important winter refuge habitat for juvenile steelhead and spring chinook salmon that migrate out of certain reaches of the Methow River to avoid dewatering or icing conditions.

Early Winters Creek also provides an important refuge for rearing juvenile spring chinook during late summer-fall low baseflow conditions. The Methow River naturally goes subsurface during late summer and into the winter in most years from the Lost River downstream to just above Weeman Bridge, a distance of 8 -11 miles (USFS 1998). Early Winters Creek provides watered habitat during those times. In addition, redds in Early Winters Creek are less likely to be dewatered than redds placed in the adjacent reach of the Methow River, and while fewer redds may be found in Early Winters Creek, they may be more likely to produce fish (USFS 1998).

Because of poor returns of adult spring chinook salmon to the Upper Columbia River ESU during the last several years, the fish have been captured at the Wells Dam on the Columbia River and have been used to artificially supplement naturally spawning populations in this ESU. However, fish counts conducted at the mainstem dams indicate that sufficient numbers of adult Upper Columbia River spring chinook salmon are returning this year to allow passage of fish to the tributary systems to naturally spawn. It is expected that some of those returning fish would attempt to spawn naturally in Early Winters Creek.

Early Winters Creek provides important rearing habitat for juvenile spring chinook throughout all 7.5 miles of accessible habitat (USFS 1998), including the action area. An August 11, 1993 electroshock survey conducted by the USFS in a 100 ft. section of Early Winters Ditch showed the presence of 5 juvenile spring chinook downstream of the fish screen. Fish that enter the ditch are not able to return to Early Winters Creek, and would eventually die when the diversion is turned off and dewatered at the end of the irrigation season.

C. Biological Requirements

The species' biological requirements may be described in a number of different ways. For example, they can be expressed in terms of population viability using such variables as a ratio of recruits to spawners, a survival rate for a given life stage (or set of life stages), a positive population trend, or a threshold population size. Biological requirements may also be described as the habitat conditions necessary to ensure the species' continued existence (*i.e.*, functional habitats) and these can be expressed in terms of physical, chemical, and biological parameters. The manner in which these requirements are described varies according to the nature of the action under consultation and its likely effects on the species (See Attachment 2).

The relevant biological requirements are those necessary for the listed species to survive and recover naturally reproducing population levels at which protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stocks, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

For this consultation, NMFS finds that the biological requirements for both Upper Columbia River steelhead and spring chinook salmon are best expressed in terms of environmental factors that define flow (includes passage conditions) and habitat quantity attributes necessary for survival and recovery of the species. These factors are described to the extent possible later under "Effects of the Action," while recognizing that a range of results have been reported for some of the factors, and that definitive information may not exist for all species at all life stages. Also, other environmental factors including suitable ocean conditions, freshwater habitat access, physical habitat elements, channel condition, hydrology, and properly functioning watersheds, where all of the individual factors operate together to provide healthy aquatic ecosystems, are also necessary for the survival and recovery of the listed species.

IV. ENVIRONMENTAL BASELINE

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action are then added. The term "environmental baseline" means "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process." (50 C.F.R. § 402.02.) The term "action area" means "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Id.

Critical habitat for both the steelhead and spring chinook salmon extends to Early Winters Creek and to all tributaries where anadromous fish range. Indirect effects extend downstream from the Willis Ditch diversion at RM 1.25, include the Early Winters Ditch headworks, and extend some

distance downstream from the creek's confluence with the Methow River. The precise downstream limit of the action area cannot be easily determined, because the extent of indirect effects of the proposed action would vary according to flow stage. However, the action area includes significant chinook spawning habitat in sections of the Methow that receive a substantial amount of their flow from Early Winters Creek during periods of low flow.

The Early Winters watershed is a 4th order tributary to the Methow River. The watershed is glacially carved and mountainous with elevations ranging from 4,100 ft. to 8,900 ft. The watershed is a Tier 1 Key Watershed[3] managed under the Northwest Forest Plan. The watershed is also managed under direction for the North Cascades Scenic Highway. The Southwest remainder of the watershed is managed as Late Successional Reserve (LSR). Underlying a portion of the LSR designation is Management Area (MA) 17. The goal of MA 17 is to provide a variety of developed recreation opportunities in a roaded setting. These recreational opportunities include camping, fishing, hiking and heli-skiing. There are three developed campgrounds in the watershed, all within Riparian Reserves. Restoration projects to minimize the impacts of those campgrounds on riparian and stream habitat were initiated in 1997. A small headwater portion of one of the tributaries is within a grazing allotment. There are two irrigation ditches that withdraw water from Early Winters Creek, the Early Winters and Willis ditches. A Watershed Analysis was completed by the USFS on the Early Winters Basin in 1996.

Access to a substantial portion of historical habitat for both steelhead and spring chinook salmon was blocked by the construction of Chief Joseph and Grand Coulee Dams on the mainstem Columbia River. For both the Upper Columbia River steelhead and spring chinook salmon ESUs, there are also local habitat problems related to irrigation diversions, degraded riparian and instream habitat from urbanization, land conversion to crops and orchards, livestock grazing, and timber harvest (NMFS 1996a, 1996b, 1997, 1998a, 1998b).

The relationships between groundwater and surface flows in the Methow Basin are complex. Surface flow in the Methow River can disappear and reappear in different reaches as it flows downstream; the groundwater can reverse its direction of flow as the water level drops in the Methow River; and it is uncertain into which aquifers and streams water goes when the irrigation diversions cease (Caldwell and Catterson, 1992). Because of the hydrologic continuity of surface and groundwater in the basin, it is possible that a large portion of the water diverted for agricultural or other domestic purposes returns to the Methow or the Columbia River, and thus, the water is available for other uses (including riparian vegetation watering, fish use, etc.) within

[3]Tier 1 key watersheds are those to be managed for at-risk anadromous salmonids, bull trout, and resident fish (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl; April 13, 1994).

the basin (Mullan et al 1992). While there may be specific instances or under certain conditions where that might occur, in the absence of information indicating when, where, and to what extent water returns, NMFS believes that diverting flow from streams and rivers contributes to the degraded environmental baseline conditions for listed anadromous fish within stream segments that could be used by fish if conditions were suitable.

The Methow Basin, including the Early Winters Creek watershed, is dominated by glacial outwash sands and decomposed granitic parent material. Sand is a major component of the channel and bank substrate. Highly erosive soils are common and occur in both wilderness and non-wilderness reaches (USFS 1998). Because sands and gravels deposited by past melted glaciers make up the principal Methow Valley aquifer, those substrates are so porous and permeable that a high degree of hydraulic continuity is virtually guaranteed as the groundwater and surface water exchange rapidly under certain conditions (Peterson and Larson, 1991). For example, snowmelt in the spring creates high flow levels in the Methow River, which caused water levels in wells in the Early Winters area to rise 10 to 25 feet in a one to two week period (Golder Associates, 1991). Conversely, during drought or low flow years, certain reaches of tributary streams and rivers to the Methow and reaches of the Methow River itself may go dry under natural conditions (i.e., without diversions) (EMCON 1993).

This high degree of hydraulic continuity is also demonstrated when certain reaches of the mainstem Methow River upstream of the Weeman Bridge (RM 59.7) exhibit no surface flow during drought years from August through October and freeze solid from December through February. This is because the upper level of the groundwater aquifer is the same as the surface water level in the Methow River. If the water depth of the Methow River is one-foot and the groundwater aquifer drops one-foot due to pumping of wells, then the Methow River is dry even though a large quantity of water is flowing downstream through the gravels under the bed of the river (Caldwell and Catterson, 1992).

Winter anchor ice[4] is another environmental baseline condition that occurs in the Methow River and certain other tributaries, and may require juvenile steelhead and spring chinook salmon to seek areas that remain ice-free to survive. Though the extent to which damage from anchor ice affects critical habitat in Early Winters Creek is not known, NMFS assumes winter freezing conditions affect juvenile steelhead and spring chinook salmon.

Most of the Early Winters Creek watershed is located within the Okanogan National Forest. About 300 acres of lands held in private ownership within the watershed have been intensively managed. Land management activities that have degraded habitat of steelhead and spring chinook salmon in this watershed include water withdrawals, road construction, timber harvest,

[4]During drought years and winter freezing conditions certain reaches of the Methow River and some tributaries may ice over from December through February. In addition, Caldwell and Catterson (1992) noted on January 30, 1992 that certain reaches of the Methow River had no surface flow but had one foot of ice covering the streambed.

the removal or lack of large, in-water wood, conversion to agricultural use, and loss or degradation of riparian habitat (NMFS 1996a, 1996b, 1997, 1998a, 1998b). In the range of both Upper Columbia River steelhead and spring chinook ESU's, land management activities have: (1) reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands; (2) elevated fine sediment yields, filling pools and reducing spawning and rearing habitat; (3) reduced instream and riparian large woody debris that traps sediment, stabilizes streambanks, and helps form pools; (4) reduced or eliminated vegetative canopy that minimizes temperature fluctuations; (5) caused streams to become straighter, wider, and shallower, which has the tendency to reduce spawning and rearing habitat and increase temperature fluctuations; (6) altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior; (7) altered floodplain function, water tables and baseflows, resulting in riparian wetland and stream dewatering; and (8) degraded water quality by adding heat, nutrients and toxicants (NMFS 1996a, 1996b; 1997, 1998a, 1998b; FEMAT 1993, USDA USFS 1993, National Research Council 1996, Spence *et al.,* 1996.

Activities in the Early Winters Creek watershed that affect anadromous fish and designated critical habitat include roads, campgrounds, and to a lesser extent some past timber harvest. There are few roads in the watershed. State Route 20 extends approximately 15 miles through the middle of the watershed. The USFS maintains approximately 6 miles of road in the Sandy Butte area. They also maintain about 1 mile of road that services the Early Winters and Klipchuck campgrounds. The greatest effect of roads on the creek is the State Route 20 crossing of the Early Winters alluvial fan near the Early Winters campground (within the action area) where the floodplain has been channelized and riprapped (USFS 1998). Those highway and road disturbances may contribute to altered flow regimes and increased delivery of sediments to streams from road surface erosion that can disrupt spawning, migration and other flow-dependent fish behavior that can result in diminished productivity (Spence *et al.,* 1996).

There are about 7.5 miles of stream accessible to anadromous fish in the Early Winters watershed, where a natural falls is a passage barrier. Most of the upper watershed is in near pristine condition and is managed as a Key Watershed under the Northwest Forest Plan for resident and anadromous fish. The remainder of the watershed is managed as LSR, with an underlying area in the southwest portion managed to provide public recreational opportunities including fishing, hiking, camping and heli-skiing (USFS 1998).

In the Early Winters watershed, natural flows can vary dramatically by season, with the highest flows occurring towards the end of May and early June. The two-year peak flow is 2,700 cfs, measured at the State Route 20 gauge (USFS 1998). Conversely, the 20-year, seven-day average low flow has been measured at 24 cfs. Low baseflow conditions occur in September and/or in February (USFS 1998). Besides the Early Winters and Willis Ditches, there are no other known surface water diversions or water transmission lines on Early Winters Creek. Early Winters Creek is on the Clean Water Act 303(d) list as impaired for instream flow because of irrigation withdrawals.

Based on the above information, NMFS concludes that not all of the biological requirements of the listed steelhead and spring chinook salmon for freshwater habitat in general, and for flows in particular, are being met under the environmental baseline in this watershed. The status of the species is such that there must be significant improvement in the environmental conditions they experience, over those presently available under the environmental baseline, to meet the biological requirements for survival and recovery of these species. Further degradation of these conditions could significantly reduce the likelihood of survival and recovery of these species due to the amount of environmental risk the listed steelhead and spring chinook salmon already face under the current environmental baseline.

V. EFFECTS OF THE ACTION

NMFS' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 C.F.R. § 402.02). "Indirect effects" are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (*ibid*). For this proposed action, no direct effects upon listed fish result from the issuance of the requested special use permits. Instead, the effects on listed fish result from operation of the Early Winters and Willis ditches under those permits, and are therefore indirect effects of issuing the permits.

The Okanogan National Forest determined the proposed action was likely to adversely affect both listed steelhead and spring chinook salmon. Since that determination of effect was made, critical habitat was designated for both species. Final rules to designate critical habitat for both Upper Columbia River steelhead and spring chinook salmon ESUs were promulgated on February 16, 2000. Critical habitat includes the action area for this action.

The Okanogan National Forest found that diverting up to 16.7 cfs (the total that both ditches have diverted in the past) is a significant percentage of the water available during late summer-early fall in normal to drought flow years, and that steelhead and spring chinook salmon using lower Early Winters Creek may be adversely affected in various ways by a substantial reduction in flow. The Okanogan National Forest considers the following to be adverse effects to the steelhead and spring chinook salmon resulting from the proposed action: (1) diverting water during declining flow conditions in late summer/early fall could affect wetted stream width/depths within the action area where incubating steelhead eggs/alevins could still be in the gravels; (2) rearing habitat (cover, feeding, migration) for juvenile steelhead and spring chinook may be reduced; and, (3) reduced instream flow may create a passage barrier that may temporarily delay or inhibit migration of adult spring chinook salmon returning to spawn. However, the Okanogan National Forest also found that those flow effects could be reduced or avoided if the permittee were to modify diversions to maintain 35 cfs instream flow in lower Early Winters Creek. This action is likely to result in an instream flow regime that approximates

natural late summer-early fall natural flow.

The USFS applied NMFS' evaluation methodology (NMFS 1996c) to assess the current environmental baseline of the Early Winters watershed and summarized the expected effects from the proposed action on the environmental baseline. The USFS found that for steelhead and chinook, both peak- and baseflows could be degraded from their already "not properly functioning"[5] environmental baseline condition (USFS 1998).

The USFS also found that off-channel habitat, width/depth ratio and floodplain connectivity within the action area would be further degraded by ditch operations from their already "at risk" environmental baseline.

In reviewing the effects of this action on listed species and designated critical habitat, NMFS evaluated effects to the two essential features of designated critical habitat most affected by the proposed action. These features include (1) streamflow conditions, and (2) habitat quantity and quality.

A. Streamflow Conditions

Snowmelt and glaciers are the primary sources of water in this watershed, and water flows can increase rapidly depending on the size of the snowpack and occurrence of warmer weather. Two characteristics of spawning habitats directly tied to streamflow are water depth and velocity. Salmonids typically deposit eggs within a range of depths and velocities that minimize the risk of dessication as water level recedes. Furthermore, these locations ensure that the exchange of water between surface and substrate interstices is adequate to maintain high oxygen levels and remove metabolic wastes from the redd (Spence *et al*., 1996). Most species typically spawn at depths greater than 15 cm, although smaller trout will spawn in shallower waters (Thompson 1972). If the diversion ditches are turned on during April-May, and winter baseflow conditions are still in effect, reduced flow and water velocity may result. Redds located in shallower depths could be dewatered in low baseflow years.

Streamflow is important in facilitating downstream movement of salmonid smolts. Dorn (1989) found that increases in streamflow triggered downstream movement of coho salmon in a western Washington stream. Similarly, Spence (1995) also found short-term increase in streamflow to be an important stimulus for smolt migration in four populations of coho salmon. Chinook salmon may gradually move downstream over several weeks or months. Different behaviors entail substantially different habitat requirements during the migration period (Spence *et al*., 1996). Thus the normal range of streamflows may be required to maintain normal temporal patterns of

[5]The terms "not properly functioning" and "at risk" refer to determinations by the agency proposing the action and are described in NMFS 1996c.

migration in a particular basin. Streamflow is also important in determining the rate at which smolts move downstream, although factors influencing the speed of migration remain poorly understood (Spence *et al*., 1996).

For salmon and other aquatic organisms, flow regimes in streams and rivers determine the amount and availability of water, the types of micro- and macrohabitats, and the seasonal patterns of disturbance to aquatic communities (Spence *et al*., 1996). High-flow events redistribute sediments in streams, flushing fine sediments from spawning gravels and allowing recruitment of gravels to downstream reaches. In addition, extreme flow events are essential in the development and maintenance of healthy floodplain systems through deposition of sediments, recharge of groundwater aquifers, dispersal of vegetation propagules, recruiting large woody debris into streams, and transporting wood downstream (Spence *et al*., 1996). Low flow conditions can reduce the amount of habitat available for juvenile salmonid refugia from predators, limit refugia suitable for avoidance of elevated water temperatures, reduce the availability of food, and increase competition for space and food sources (Gregory & Bisson 1997). Natural variations in river flows occur some years due to storm events of short duration that may increase surface flows for a few days. However, such events are not sustained and sufficient in magnitude to provide necessary flows for fish throughout the period of normal flows in late summer and early fall.

The number of spawning salmon and trout that can be accommodated in a given stream depends on the availability of suitable habitats for redd construction, egg deposition, and incubation (Bjornn and Reiser 1991). In general, the amount of habitat suitable for spawning increases with increasing streamflow; however, excessively high flows can cause scouring of the substrate, resulting in mortality to developing embryos and alevins (Hooper 1973).

Where water is withdrawn from smaller rivers and streams, seasonal or daily flow fluctuations may affect fish, macroinvertebrates in littoral areas, aquatic macrophytes, and periphyton (reviewed in Ploskey 1983). Fluctuating water levels may delay spawning migrations, impact breeding condition, reduce salmon spawning area (Beiningen 1976), dewater redds, expose developing embryos, strand fry (CRFC 1979), and delay downstream migration of smolts. Low flows also reduce the habitat available for spawning spring chinook and for juvenile steelhead and chinook rearing (USFS 1998). The effect of irrigation diversion operations on out-migrating steelhead and spring chinook salmon smolts in Early Winters Creek is unknown. The literature suggests that irrigation diversions contribute to low flows that are likely to inhibit or delay salmonid smolt out-migration. This delay could limit fish survival and reduce potential numbers of returning adults (NPPC 1986).

Off-channel habitat in Early Winters Creek can provide important refugia habitat for rearing juvenile salmonids from warmer summer and cold winter temperatures that may occur in the adjacent reach of the Methow River, particularly when certain reaches of the Methow River located upstream of the confluence of Early Winters Creek go dry during drought conditions or freeze up during the winter (USFS 1998; Caldwell and Catterson 1992). When seasonal low

flows occur, deep pools with cool-groundwater inputs are needed to provide the necessary cover and thermal refugia for juvenile salmonids. Water withdrawals affect the quality of pools in the lower 1.25 miles of Early Winters Creek by reducing depth and wetted area and width. Among juvenile salmonids this can result in increased competition for food, reduced dissolved oxygen levels, increased physiological stress, and vulnerability to predators. Diversions may cause dewatering of off-channel habitat and a reduction in the quality and quantity of refugia habitat available for juvenile salmonids.

In addition, Early Winters Creek provides a significant amount of the flow to the Methow River during low flow conditions. The confluence of the creek and the Methow River is at RM 67.3, just above the reach that includes the largest concentration of chinook spawning habitat in the Methow. Diversions likely cause a reduction in flow levels in this spawning habitat.

Natural flows in Early Winters Creek can vary dramatically by season, with the highest flows occurring toward the end of May and June (2 year peak flow of 2700 cfs). Baseflows can occur from late July until mid-winter (20 year, seven-day average low flow of 24 cfs) (USFS 1998). In some drought or low baseflow years (once every 20+ years), complete dewatering of the lower 0.5 mile of Early Winters Creek may occur (USFS 1998).

Irrigation diversions in the Methow Basin generally commence by mid-April, continue throughout the summer, and cease by mid-October of each year. Early Winters Ditch Company's claim allows diversion to begin on April 1 and to continue to November 1. The start-up period to irrigate usually coincides with the time adult steelhead have migrated from the Columbia River into the Methow River to spawn (mid-March through May). Steelhead spawning in the upper mainstem and tributaries (Early Winters) occurs from mid-March through early July (USFS 1998). In cold tributary streams like Early Winters Creek, steelhead fry emergence often does not take place until September (Mullan, *et al.*, 1992).

The Early Winters Ditch diverts about 15 cfs and the Willis Ditch diverts about 1.7 cfs from Early Winters Creek. These diversions represent about 63 percent and 7 percent, respectively, of the 20-year, seven-day average low flow of 24 cfs (USFS 1998). Their combined withdrawals are approximately 17 cfs, which is about 71 percent of the 20-year, seven-day average low flow. The low flow periods typically begin in late July and could extend through the remainder of the irrigation season (mid-October).

The WDOE adopted a rule setting minimum instream flows for Early Winters in December 1976 (Caldwell and Catterson 1992). The state minimum instream flows set by WDOE for Early Winters Creek range from 8 cfs to 290 cfs and were established at RM 1.0, which is located above the Early Winters diversion (RM 0.5) and just below the Willis ditch diversion (RM 1.25). In addition, the minimum flows apply only to water rights that were established after 1976. Because the water rights or claims for Early Winters and Willis ditches pre-date the 1976 rule, the minimum flows do not apply to their operations. Finally, the minimum flows were based on hydrograph data correlated from the USGS gauge on the Methow River near Pateros, along the

Columbia River. Unfortunately, this was a poor correlation because there was no flow data from Early Winters Creek. Because of this error, the minimum flows were based on incorrect hydrologic statistics (Caldwell 1999).

An Instream Flow and Incremental Methodology (IFIM) study for the Methow River Basin was conducted by WDOE (Caldwell and Catterson 1992), and included a study site at RM 1.0 on Early Winters Creek. The study found that the highest quantity of habitat occurs at flows of 475 cfs for spawning steelhead, at 325 cfs for spawning spring chinook salmon, at 150 cfs for juvenile steelhead rearing, and at 50 cfs for juvenile chinook rearing. However, it appears that under natural flow conditions, these optimum flows often cannot be met even in average or above average (50 and 20 percent exceedence, respectively) flow years in lower Early Winters Creek from late July until the beginning of the next irrigation season in April (Caldwell and Catterson, 1992 and Golder, 1993).

In 1999, Golder Associates collected their own flow measurements and compiled flow data from USGS, WDOE, and Hosey and Associates collected over the last 20+ years.[6] A subsequent independent review of that flow data by WDOE resulted in agency concurrence with the Golder Associates analysis. That flow data is contained in the Early Winters Final 2000 Operation Plan, and forms the basis of the applicant's plan to modify surface water diversions to maintain a flow of 35 cfs, as measured at the State Route 20 bridge at RM 0.25.

The analysis of the flow data by Golder and WDOE showed that late summer/early fall natural baseflow conditions, as measured at the State Route 20 bridge gauge, ranged from 44 cfs to 22 cfs. These numbers are consistent with those found an earlier study conducted by Golder Associates (1993), which compared flow data from Early Winters to a synthetic hydrograph developed for Andrews Creek, a similar tributary to the Methow. Andrews Creek provides an appropriate surrogate for Early Winters Creek because it has similar basin characteristics, precipitation patterns, and water uses. The Andrews Creek hydrograph showed that late summer/early fall natural baseflow conditions ranged from 30 to 23 cfs.

The Golder analysis indicated that through August, infiltration along the channel into groundwater reduced surface flow. Flow measurements in early September indicated the creek appeared to begin to transition from a losing stream to a gaining stream; the surface water input to instream flows became less significant than groundwater because the ground was becoming saturated. At this point, groundwater baseflow began to dominate the hydrograph. By early October, the potential impact of ditch turn-off appeared to be more pronounced, so that if the ditch were turned off, flows in the creek would probably rebound by a corresponding amount. At this time, the ground was fully saturated and the transition to groundwater dominance was complete. The break in the hydrograph when the creek became baseflow dominant in 1999 was

[6] Flow data was provided by the United States Geological Survey (USGS) from 1975 to 1984, Hosey and Associates for 1990, WDOE for 1991, and Golder and Associates in 1993 and 1999.

at about 35 cfs (Golder and Associates, 1999 and Caldwell, 1999). About a week later, the ditch was turned off and the flows in the creek rebounded by an amount equivalent to the diversion.

The analysis concluded that once the creek becomes baseflow dominant, all surface water run-off remains in the stream and flows directly into the Methow River. It is at this point, or at 35 cfs in 1999, that diversions from Early Winters and Willis ditches appear to have a nearly 1:1 relationship of reducing instream flows necessary to meet the biological requirements for fish. Prior to this point, it is difficult to quantify the effects of diversions on instream flows, because an unknown percentage of the surface flow appears to infiltrate to groundwater.

Low flow periods in late summer and early fall appear to be the times of most concern for fish during the irrigation season (Caldwell and Catterson, 1992; USFS, 1998). Prior to this time, flows are generally adequate to meet fish needs. While flows may be low in April and early May when a cool spring prevents early snowmelt, the permittee would delay or reduce diversion until the point at which diversion would not cause instream flow to fall below 35 cfs. During late spring and early summer, flows are at their highest. During this time, it is unlikely that diversion of the maximum amount allowed under the permit, 14 cfs, would reduce flows below those necessary to meet the needs of listed fish.

It is in late summer and early fall when adequate flows for passage and spawning may not be provided. The period when flow transitions from surface water dominant to groundwater dominant appears to coincide with the late summer/early fall decline in surface flows, and it is also at this point when all water not diverted would remain on the surface and provide water for fish. Modifying surface water diversions to maintain flow so that it does not fall below the break in the hydrograph, or 35 cfs (from the limited data available), would help maintain natural flow conditions in Early Winters Creek from late summer, throughout the fall and winter, and until flows reach 35 cfs the next spring and irrigation begins again. All water not diverted would flow into the Methow River at this point, providing near natural flows for spawning chinook in the Methow itself as well as in Early Winters Creek.

Early Winters Ditch Company proposes to withdraw groundwater to supplement reduced surface diversions, if necessary. The impacts of these proposed groundwater withdrawals are uncertain. Preliminary analysis indicates that deep groundwater aquifers exist in the Early Winters Creek watershed that are not in direct hydraulic continuity with surface waters in Early Winters Creek (Anderson, 1999). If this is the case, the proposal to irrigate from wells drilled to the deep aquifers would preserve natural instream flows during the late summer and early fall. NMFS believes that a conversion to a deep groundwater system would have minimal impacts on instream flows during this period due to the dominance of groundwater in the lower watershed and the lag time associated with limited groundwater withdrawals from deep water aquifers (Golder Associates Inc., 1999). Prior to converting to wells, the ditch owners will conduct studies to verify the surface-groundwater interactions and ascertain the impacts of potential groundwater withdrawals on surface waters in Early Winters Creek.

The studies referenced above represent a relatively short and incomplete period of record and do not cover all the natural cycles of climate and water yield. However, this scientific information is currently the best available for determining natural late summer/fall baseflow conditions for Early Winters Creek. NMFS expects that additional flow data will be obtained by the USFS and the ditch operators to refine future flow regimes for Early Winters Creek.

Particular streamflow effects on each of the two listed species are discussed below.

1. Upper Columbia River Steelhead

In the upper Methow Basin watersheds, including Early Winters Creek, steelhead spawning may continue into early July (USFS 1998). Fertilized embryos develop for a period of one to several months, depending on water temperature and dissolved oxygen availability, before hatching occurs. Incubating eggs or alevins (hatched larval stage fish) would likely still be in the gravels when flows would naturally begin dropping below optimal conditions. Using the IFIM optimum curves for weighted usable area (Caldwell and Catterson 1992) and the 50 percent exceedence-frequency hydrograph for Early Winters Creek in 1993 (Golder Associates Inc. 1993), optimal flow conditions for spawning steelhead are approximately 475 cfs. However, natural stream flow would drop below 475 cfs by about the first week in July during an average flow year and continue to drop through the ditch turnoff date in mid-October. Operating the Early Winters and Willis ditches would contribute to naturally declining flow conditions in late summer that could affect developing embryos or strand alevins still in the gravel during below average flow years, potentially resulting in hindered embryonic development and/or direct mortality. Steelhead eggs or alevins may also be at a higher risk for dewatering/stranding where spawning fish have deposited their eggs at the margins of streams.

Caldwell and Catterson (1992) also concluded the optimal stream flow conditions for juvenile steelhead rearing habitat are approximately 150 cfs. In average flow years, Early Winters Creek would drop below 150 cfs by about the third week in July. Operation of the Early Winters and Willis ditches to divert water would contribute to the already naturally declining instream flows; thus decreasing the quantity of refugia habitat available to juvenile steelhead to avoid predators, reducing the availability of food, and concentrating fish to compete for space and food. However, this degradation would be of short duration, since diversions would be modified at the point when they would cause the flow to fall below 35 cfs. The natural flow regime would then be maintained throughout the winter.

Minimum depth that will allow passage of steelhead is approximately 18 cm (7 inches) (Thompson 1972, Bjornn and Reiser). Substantially greater depths may be needed to negotiate large barriers (Stuart 1962). The ability to pass a barrier is also influenced by pool configuration. Less severe inclines may be more difficult to pass if pool depths are inadequate and velocities are high (Stuart 1962). Because of high spring instream flows and ongoing in-channel habitat restoration actions in the lower Early Winters Creek watershed, habitat conditions, over the long-term, would be expected to improve for migrating adult steelhead seeking spawning habitat.

Measurements taken in 1999 indicate that 31 cfs instream flow provides 12 inches of channel depth at the State Route 20 gauge (Golder Associates 1999). Consequently, it is likely that maintaining 35 cfs will provide adequate channel depths for migrating adults.

Migrating juvenile fish are particularly vulnerable to predation because they often are concentrated and may move through areas with limited cover and a high abundance of predators. The lower reach of the Early Winters watershed has been modified by land management actions that have removed habitat complexity (riparian vegetation and large woody debris) needed for juvenile salmonids (USFS 1998). Operating the ditches during natural declining flow conditions, particularly during late summer, could increase competition among juvenile steelhead for shelter/cover, food, and space. However, recent in-channel and riparian habitat restoration projects (the subject of other consultations) have been completed and will continue to add large woody debris and habitat complexity to the lower reach of Early Winters Creek.

Depending upon the species or population, some juvenile salmonids migrate to the sea or lakes, while others remain in a relatively small reach of stream for their entire lives (Bjornn and Reiser 1991). All species require unobstructed (either chemically or physically) access to upstream or downstream reaches for migration or dispersal to feeding grounds (Spence *et al*., 1996). In addition, species and stocks differ in their migratory behavior (i.e., timing and speed). As previously referenced in this BO, there is evidence to suggest that juvenile steelhead in Early Winters Creek that do not attain mean threshold size for smoltification because of cold-water temperature will remain a resident in freshwater. Thus, steelhead likely reside year round in Early Winters Creek and may need to seasonally migrate up or downstream in search of food, cover, or to avoid seasonal stranding. Operating the water diversions during naturally declining flow or in drought conditions could inhibit the upstream or downstream passage of juvenile fish.

Most of the habitat indicators in the environmental baseline of the lower Early Winters Creek watershed are functioning at risk for Upper Columbia River steelhead. The continued diversion of surface water at declining flows that approach baseflow conditions could contribute to a short-term degradation in the Peak/Baseflow (instream flow) habitat indicator for steelhead. However, this degradation would be of short duration, since diversions would be reduced at the point when they would otherwise cause streamflow to go below 35 cfs.

2. Upper Columbia River Spring Chinook Salmon

Adult spring chinook salmon migrate into the Methow River in May and June. In 1987, adult spring chinook were observed spawning in the lower reaches of Early Winters Creek starting in late July, peaking August 9, and ending on August 13 (Caldwell and Catterson, 1992). Historically, the Early Winters and Willis ditches have operated each year when adult spring chinook salmon return to spawn. When operating during late summer-early fall low baseflow conditions in normal or drought flow years, the ditch diversions could potentially contribute to instream flow conditions that could delay upstream migration and reduce available spawning

habitat.

During this critical time for spawning, the combined irrigation diversions from the Early Winters and Willis ditches could remove up to approximately 43 percent of the available surface flow from the lower 0.5 miles of the creek, based on the two-year, seven-day average low flow (USFS 1998). If surface water diversions were to continue operating as in the past, when late summer-early fall baseflow conditions are reached, there would likely be an appreciable reduction in the availability of potential spawning habitat and low flow barriers that would hinder or delay migration of returning adults to potential spawning habitat. The fraction of Early Winters Creek flow removed by the ditches could even be greater during drought conditions.

The IFIM concluded that optimal instream flows for spring chinook salmon spawning habitat in Early Winters Creek are 325 cfs (Caldwell and Catterson 1992). Using flow measurements from the 50 percent exceedence-frequency hydrograph for Early Winters Creek in 1993 (Golder Associates Inc. 1993), optimal flow conditions for spring chinook spawning ranged into the middle of July. Those flow conditions would coincide with the arrival of adult spring chinook returning to spawn in Early Winters Creek. The 1993 flow hydrograph would suggest that flows would have naturally declined to about 80 cfs when chinook spawning would have ended. Chinook salmon will spawn in water depths from a few centimeters to several meters (Bell 1991), which suggests the range in depths that chinook find acceptable is very broad (Groot and Margolis 1991). Optimum spawning depths for chinook are considered to be 0.8 ft (9.6 inches) (Thompson 1972). That flow data would suggest that during average and above average flow years returning adult spring chinook salmon would not likely be hindered from accessing the creek by low flow barriers.

Stream conditions during incubation can have a dramatic effect on the survival of incubating eggs. Experiments by Gangmark and Broad (1955) and Gangmark and Bakkala (1960) in Mill Creek, California, demonstrated that aside from large floods, chinook egg mortality was associated with low oxygen in the spawning gravel (less than 5 ppm) and poor percolation of water through spawning gravel (Groot and Margolis 1991). Adequate water percolation through the spawning gravels is essential for egg and alevin survival. Becker et al. (1982, 1983) investigated the effects of dewatering artificial chinook redds on survival and development rate of embryos at various stages of development. Alevins were most sensitive to both periodic short-term dewatering and a prolonged single dewatering, surviving at less than 4 percent in periodic dewaterings of one hour or a single dewatering of six hours (Groot and Margolis 1991). The development rate of embryos was also reduced in those instances in which survival was affected but not in instances when survival was good (Groot and Margolis 1991).

The Golder Associates 1993 synthetic hydrograph (normal flow year) for the 50 percent exceedence flow in lower Early Winters Creek showed that flows required to maintain juvenile chinook rearing habitat would decline below optimum conditions by the first week in September, based on no surface water diversions. Low baseflow conditions of 29 cfs were reached by mid-October when ditch turn off would normally occur. Since surface water diversions would be

modified when instream flows approach 35 cfs in lower Early Winters Creek, near natural instream flow conditions would be expected to prevail until the next irrigation season.

The rates of chinook survival from fry to fingerling migrant stage are unknown, but mortality is presumed to be heavy in all rivers (Groot and Margolis 1991). Low flow conditions limit the quantity of refugia available for predator avoidance, reduce the availability of food, and increase competition for space and food. Flow diversions may affect juvenile rearing habitat in Early Winters Creek as flows naturally decline towards baseflow conditions during an average or below average flow year.

Streamflow during the spawning migration must be sufficient to allow passage over physical barriers including falls, cascades, and debris jams; as a result, migrations of many stocks occur coincident with high flows (Spence *et al*., 1996). Spring and summer chinook adults migrate during periods of high flows that allow them to reach spawning tributaries in headwater reaches, while fall-run stocks, which typically spawn in lower reaches, may enter streams during periods of relatively low flow (Healey 1991).

Minimum depth that will allow passage of large chinook salmon is 24 cm (9.4 inches) (Thompson 1972, Bjornn and Reiser 1991); however, substantially greater depths may be needed to negotiate large barriers (Stuart 1962). The ability to pass a barrier is also influenced by pool configuration. Less severe inclines may be more difficult to pass if pool depths are inadequate and velocities are high (Stuart 1962). During a drought, low instream flow conditions in Early Winters Creek may delay or hinder adult spring chinook salmon from entering the creek to spawn from July to August. Operating the diversion during a low-flow or drought year could exacerbate passage conditions for adult chinook and could delay or prevent upstream passage**.**

As previously noted, measurements taken in 1999 indicate that 31 cfs instream flow provides 12 inches of channel depth at the State Route 20 gauge (Golder Associates 1999). Consequently, it is likely that maintaining 35 cfs will provide adequate channel depths for migrating adults.

Migrating juvenile fish are particularly vulnerable to predation because they are often concentrated and may move through areas with limited cover and a high abundance of predators. The lower reach of the Early Winters watershed has been modified by land management actions that have removed habitat complexity (riparian vegetation and large woody debris) needed for juvenile salmonids (USFS 1998). The historic operation of surface water diversions during low baseflow conditions would increase competition among juvenile chinook salmon for shelter/cover, food, and space in the action area. The proposed action would improve these conditions over historic practices.

Depending upon the species or population, some juvenile salmonids migrate to the sea or lakes, while other remain in a relatively small reach of stream for their entire lives (Bjornn and Reiser 1991). All species require unobstructed (either chemically or physically) access to upstream or downstream reaches for migration or dispersal to feeding grounds (Spence *et al*., 1996). In

addition, species and stocks differ in their migratory behavior (i.e., timing and speed). For example, juvenile chinook salmon may gradually move downstream over several weeks or months (Spence *et al*., 1996).

Most of the habitat indicators in the environmental baseline of the lower Early Winters Creek watershed are functioning at risk for Upper Columbia River steelhead. The diversion of surface water at declining flows that approach baseflow conditions could contribute to a short-term degradation in the Peak/Baseflow (instream flow) habitat indicator for chinook. However, this degradation would be of short duration, since diversions would be reduced at the point when they would otherwise cause streamflow to go below 35 cfs.

3. Groundwater Recharge

There is a widespread belief in the Methow Valley that irrigation water that infiltrates anywhere is quickly returned to streams where that water can support fish and productive fish habitats. No information to verify the claims that groundwater recharge is ubiquitous (such as data control points or gauges) was presented during this consultation. In addition, a search of the literature has found no evidence of any well log data or subsurface well control to verify transmissivity rates that would support that belief. The IFIM report (Caldwell and Catterson 1992) suggests that aquifers are complex and not well understood for the Methow Valley. According to Mullan et al (1992), "available geologic data are inadequate for delineating formations and aquifers that have relatively good or poor water-yielding characteristics in the Methow Valley." Mullan et al (1992) also cite Nassar (1973) that the actual contribution of return water depends not only on the storage characteristics of the aquifer, but also on the local hydraulic gradient and the degree of transmissivity between the stream and the groundwater. In areas where return flows are suspected (e.g., Early Winters Creek, Chewuch River and the Wolf Creek subbasin) the flows often do not reach the main channel for many miles downstream. The delay in returning flows results in dewatering of stream and tributary habitats (EMCON 1993).

The IFIM report also discusses the effects when ditches are turned off in the fall and water levels in the Methow River do not immediately return to full flows (Caldwell and Catterson 1992). For example, six days after the Chewuch irrigation ditches stopped diverting 64.2 cfs in early October, 1991, the flow in the Methow had increased only 1 cfs compared to flows during diversions (from 228 to 229 cfs). Other observed effects were a recovery of only 39 percent of pre-diversion river flows near Twisp two days after the irrigations were turned off. The authors of the IFIM report speculate that the missing water was still bound in groundwater along the riparian areas, where the demand for bank storage would not be met for some period of time (Caldwell and Catterson 1992).

This information suggests that operating surface water diversions during low baseflow conditions not only reduces the instream flow that adversely affects listed steelhead and spring chinook salmon directly, but would also contribute to a seasonal reduction in the volume of water stored in the riparian groundwater bank. A seasonal reduction in riparian groundwater storage

exacerbated by water withdrawals, which coincides with the growing season, could potentially inhibit or prevent riparian vegetation from establishing or obtaining future proper functioning condition because water may not be available to the root zone during the growing season. Thus, the diminished health and lower density of plants, shrubs, or trees (riparian community) that provide bank stabilization, shade, organic debris, food sources (insects), and future large woody debris in the action area could have significant long-term adverse affects to designated critical habitat for both steelhead and spring chinook salmon. The adverse effects on listed fish of reduced groundwater storage during the irrigation season likely outweigh any benefits of later groundwater recharge from irrigation withdrawals.

The proposal to reduce surface water diversions to maintain 35 cfs would help maintain natural flow conditions in early Winters Creek. Although the direct and indirect impacts to surface flows are not certain at this time, NMFS believes that a conversion to groundwater withdrawals to maintain 35 cfs surface flows would have minimal impacts on instream flows during this period due to the dominance of groundwater in the lower watershed in late summer and early fall, and the lag time between groundwater withdrawals from deep water aquifers and the point when they register in surface flows (Anderson, 1999 and Golder Associates, Inc., 1999). It is expected that maintaining near natural instream flow conditions in lower Early Winters Creek would aid in riparian groundwater storage that is essential for restoring riparian vegetation and, in the long-term, promote bank stabilization, shade, food sources and refugia for all life stages of both steelhead and spring chinook salmon.

B. Habitat Quantity and Quality

The physical structure of streams and rivers plays a significant role in determining the suitability of aquatic habitat to salmonids as well as other organisms upon which salmonids depend for food. These structural elements are created through interactions between natural geomorphic features, the power of flowing water, sediments delivered to the channel, and riparian vegetation which provides bank stability and large woody debris inputs (Spence, *et al*., 1996). Spatial differences and gradients give rise to a variety of macro- and microhabitat attributes that are used by salmonids at various stages of their life histories. Macrohabitat features include pools, glides, and riffles. The relative frequency of these habitat types changes with the size of the stream, the degree of channel constriction, and the presence of large woody debris (Spence, *et al*., 1996). Microhabitat attributes include characteristics such as substrate type, cover, depth, hydraulic complexity, and current velocity (Spence *et al*., 1996).

Peak and baseflows have been determined by the Okanogan National Forest to not be properly functioning for the lower 0.5 mile of Early Winters Creek (USFS 1998). Ditch operation, especially when conducted at summer/fall baseflow conditions, could appreciably diminish both macro- and microhabitat features referenced above by reducing the volume and velocity of water in the creek. This condition would be ameliorated by the short duration that the surface water diversion would remain in full operation, because natural instream flows probably would continue to decline rapidly to average (approximately 35 cfs) or below average baseflow

conditions. At that point, the diversions would be modified to maintain 35 cfs, or would cease operations if 35 cfs could not be maintained with diversions.

Activities in the watershed that affect anadromous fish and designated critical habitat include roads and, to a lesser degree, historical timber harvest. State Route 20 crosses the lower Early Winters floodplain and campground development adjacent to the creek could affect peak flows because of increased drainage network and altered peak runoff patterns, and loss of riparian habitat. Highway and bridge construction resulted in constricting the lower Early Winters Creek floodplain channel and hardening the bridge approaches with riprap. The loss of riparian habitat has limited the opportunity for large woody debris recruitment in the project action area. Instream and riparian habitat restoration projects have been and continue to be implemented in lower Early Winters Creek to improve large woody debris, channel complexity, and side channel habitat.

There are about 7.5 miles of stream accessible to anadromous fish in the watershed. The upper watershed is in near pristine condition, and provides an important buffering effect in comparison to the more intensely managed lower watershed. Roads, recreation, agricultural, and residential development take place in the lower watershed where soil erosion and sediment delivery rates are accelerated by management activities. The action area for this proposal is located in the lower Early Winters Creek watershed where land management activities conducted on both federal and private lands have contributed to a degraded environmental baseline condition.

Although it was not possible with the available data to complete the quantification of habitat loss and assess its effect on the Early Winters and Methow River steelhead and spring chinook population, any habitat loss becomes a concern given the environmental baseline condition of the lower early Winters Creek watershed. The environmental baseline has been largely influenced by management activities causing altered peak- and baseflow patterns, altered floodplain connectivity, loss of large woody debris, sedimentation, and loss of riparian habitat. The effect of those activities may, in combination with this water withdrawal, reduce pool frequency and depth and reduce habitat quantity in lower Early Winters Creek.

Habitat function in the lower Early Winters Creek watershed is also at risk from land use and development activities that degrade or prevent attainment of properly functioning conditions (USFS 1998). The proposed water withdrawals during declining instream flow conditions in late summer/early fall could further exacerbate or degrade habitat conditions for salmonids by reducing the quantity and quality of habitat available for egg/alevin development, rearing, cover/shelter, food, and space. Maintaining the proposed instream flow conditions in lower Early Winters Creek should aid in restoring, in the long-term, both habitat quality and quantity by promoting riparian vegetation, bank stabilization, shade, food sources, and refugia for all life stages of steelhead and spring chinook salmon.

C. Summary of Effects

The upper Early Winters watershed is functioning appropriately for the factors and habitat indicators that influence salmonid populations and production (USFS 1998). However, the lower watershed, including the action area, has been subjected to continuing land management activities that have degraded riparian and instream habitats. To minimize the impact of surface water diversion during seasonal low flows, the special use permit would require the applicant to reduce or curtail surface water diversions as necessary to maintain flows of 35 cfs as measured at the State Route 20 bridge crossing (RM 0.25). Diversion would cease altogether if 35 cfs could not be maintained. Based on the limited data available, this instream flow is the point at which groundwater dominates the hydrograph and thus all flow not diverted would remain in the stream and flow into the Methow River. It occurs in late summer and coincides with the time when low flow conditions would begin to have the most serious effects on fish, particularly interference with successful stream passage.

The proposed action would maintain near natural flow conditions in the lower watershed during a critical time for listed salmon and steelhead and would likely improve the instream peak/baseflow habitat indicator. The proposed action would also help maintain instream habitat conditions sufficient for passage, spawning, and rearing for both steelhead and spring chinook salmon. For steelhead, the importance of maintaining natural flow conditions could become magnified during the late summer/early fall when embryos in their redds would be hatching and alevins are emerging from the gravels, and for rearing juveniles. For spring chinook, the instream flow needs could become magnified for adults attempting to return to spawn and for rearing juveniles.

Finally, the ongoing upgrading of the Early Winters Ditch Company surface water diversion facilities and implementing the Final 2000 Year Operating Plan will promote more water conservation in the future and likely will decrease the amount of surface water diverted from Early Winters Creek for irrigation purposes.

VI. CUMULATIVE EFFECTS

Cumulative effects are defined as “those effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation” (50 C.F.R § 402.2). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Gradual improvements in habitat conditions for salmonids are expected on Federal lands as a result of the Northwest Forest Plan implementation. Significant improvements in Upper Columbia River steelhead and Upper Columbia River spring chinook salmon production outside of USFS and Bureau of Land Management lands are unlikely without changes in forestry, agricultural, and other practices occurring within non-Federal riparian areas. NMFS is aware that significant efforts, such as the Omak Creek Watershed Plan (1995) and the Early Winters

Watershed Analysis (1996), have been developed to improve conservation and restoration of steelhead and chinook salmon habitat on non-Federal land. Local improvements to currently degraded habitat conditions may occur as a result of water diversion upgrades being planned in the Methow Basin.

Existing studies (Peterson and Jackson, 1990, EMCON, 1993, and Methow Valley Planning Committee, 1994) have documented the potential build-out of the Methow Basin that would likely occur if individuals convert water currently used for irrigation to domestic or other annual uses. The impacts to instream flow during low flow periods, late summer/early fall and winter, have not been documented. However, estimates from these reports show that if only 5 percent of the saved water from total irrigable acres (12,900 acres) is converted to domestic use, an additional 950 homes could be built in the basin, which would support approximately 2,800 people. The basin's current population is only 4,500. Given the fragile nature of this ecosystem, it is clear that tighter land use and water use regimes are required to not only recover the listed species, but to support the build-out that could be realized from using only 5 percent of the saved water.

One measure of potential cumulative impacts is the number and magnitude of applications for water rights within the action area on Early Winters Creek. As of this date, there are 14 applications to WDOE for groundwater wells, totaling about 23 cfs (10,330 gal/min), and three applications to withdraw 12 cfs of surface water. The trend toward groundwater applications is expected to continue**.** However, WDOE has indicated that any additional groundwater permits would be conditioned on withdrawals from deep-water aquifers that are not in hydraulic continuity with Early Winters Creek or the Methow River (Barwin, 1999).

There are no other known surface water diversions operating in the Early Winters Creek watershed. Until improvements in non-Federal land management practices occur, NMFS assumes that future private and State actions will continue at similar intensities as in recent years. Now that the Upper Columbia River steelhead and spring chinook salmon ESUs are listed under the ESA, NMFS assumes that non-Federal landowners in those areas will also take steps to curtail or avoid land management practices that would result in the take of those species. Such actions are prohibited by section 9 of the ESA, and subject to the incidental take permitting process under section 10 of the ESA. Future Federal actions, including the on-going operation of hatcheries, harvest, and land management activities will be reviewed through separate section 7 processes.

VII. CONCLUSION

Access to a substantial portion of historical habitat for both steelhead and spring chinook salmon was blocked by the construction of Chief Joseph and Grand Coulee Dams on the mainstem Columbia River. Because of this reduction in access to historical habitat, and because of the relatively pristine habitat conditions in the upper watersheds of the Methow Basin, accessible habitat in the Methow Basin assumes significance in the survival and recovery of these ESUs

disproportionate to the amount of habitat in these watersheds. Consequently, NMFS must closely scrutinize water diversion in the basin that could significantly degrade this important habitat.

The timing and operation of diversions may affect embryonic (alevin) development and fry emergence of steelhead from the gravel in lower Early Winters Creek by contributing to reduced instream flow in late summer/early fall. Spring adult chinook salmon returning to spawn in Early Winters Creek and the Methow River may be affected by declining instream flows that may hinder or inhibit passage to suitable spawning habitat. Rearing habitat, which provides cover, food, and passage for juvenile steelhead and chinook salmon may be degraded or dewatered. These effects may result in displacement of fish and/or mortality of eggs and fish. Operating diversions to maintain 35 cfs streamflow at RM .25 of Early Winters Creek, however, is a significant improvement over past conditions and, according to the best scientific information available at this time, would approximate late summer/fall natural streamflow conditions. The essential life stage requirements for passage, spawning, and rearing for steelhead and spring chinook salmon likely will be achieved, and thus the proposed action will not appreciably reduce the likelihood of survival and recovery of the listed species. NMFS also expects that upgrading the headgate, fish screens, and ditch infrastructure will significantly contribute to future water conservation in lower Early Winters Creek.

Accordingly, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of the Upper Columbia River steelhead and Upper Columbia River chinook salmon, or to result in the destruction or adverse modification of designated critical habitat. This determination is based on the current status of Upper Columbia River steelhead and Upper Columbia River spring chinook salmon, the environmental baseline in the action area, and the effects of the proposed action.

VIII. INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by "significantly impairing behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering." (50 C.F.R. § 222.102) Incidental take is take of listed species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary; they must be implemented by the action agency so that they become binding conditions of any grant or permit issued to the applicant in

order for the exemption in section 7(o)(2) to apply. The USFS has a continuing duty to regulate the activity covered in this incidental take statement. If the USFS fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of 7(o)(2) may lapse.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of the Take

The NMFS anticipates that the action covered by this biological opinion may result in incidental take of listed species through stream diversion or low flows. The proposed action is not expected to result in the adverse modification of critical habitat of both steelhead and spring chinook salmon. The proposed action, modified by the reasonable and prudent measures and terms and conditions, is expected to result in a substantial decline in the extent of take. Effects of the action such as these are largely unquantifiable, but are not expected to be measurable as long-term effects on the species' habitat or population levels. The best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of incidental take to the listed species. In instances such as these, NMFS anticipates the expected level of take as "unquantifiable." Based on the information in the BA, NMFS anticipates that an unquantifiable amount of incidental take could occur as a result of the action covered by this biological opinion.

B. Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to avoid take of the listed species:

1. The USFS will require that the Early Winters and Willis ditches headgates be inspected by their operators to ensure proper operation prior to commencing ditch operations each irrigation season.

2. The USFS will require that diversion flows will not exceed the design criteria for the fish screen. Surface water diversion from Early Winters Ditch will not exceed 14 cfs. Surface water diversion from Willis Ditch will not exceed 1.7 cfs.

3. The USFS will require the permittees to operate the Early Winters and Willis ditches to ensure compliance with a minimum instream flow of 35 cfs, as measured at the State Route 20 bridge crossing, during the irrigation season.

4. The USFS will require each permittee to ramp down diversion flows prior to shutting off the diversion. This is necessary to stimulate fish to voluntarily migrate out of the diversion bypass reach prior to ditch turn off.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the parties must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. The USFS will inspect the headgate and fish screen works at the completion of any structural improvements to ascertain required construction standards have been met.

2. The USFS will require each permittee to design, construct, and maintain a fish screen that is adequate to prevent impingement or injury of fish at the full range of potential diversion flows. The fish screen design, construction, and maintenance will be consistent with screen criteria developed by the National Marine Fisheries Service (NMFS 1995). By the fall of 2000, the existing fish screen on Early Winters ditch (with temporary mesh that meets NMFS criteria) must be replaced with a permanent screen.

3. The USFS will require Early Winters Ditch Company to install and/or maintain continuous flow monitoring devices located (1) at the upstream point of diversion of Early Winters Ditch; (2) in Early Winters Ditch; and, (3) downstream of the diversions at the State Route 20 bridge crossing of Early Winters Creek (approximately RM 0.25). Each year the permittee will provide flow-monitoring data from these devices to the USFS by November 1.

4. The USFS will require the Early Winters Ditch Company to notify the USFS when instream flow at the State Route 20 bridge gauge at RM 0.25 falls to 45 cfs. At that time, the USFS will ensure that the permittee begins incrementally ramping down the flows at the Early Winters headgate to stimulate fish that may be rearing in the ditch upstream of the screens to migrate from the ditch via the bypass flow. This flow ramping down procedure will be implemented 5-7 days prior to ditch shut off. Ramp-down procedures will be consistent with those promulgated by WDFW in its guidance on Fish Bypass Operation and Procedure for Coordinating Fish Bypass and Diversion Headgate Operation.

5. The USFS will require that each permittee modify their diversion operations to maintain instream flow of 35 cfs in Early Winters Creek, as measured at the State Route 20 bridge crossing at RM 0.25. This means that the permittees will cease or delay diversion if 35 cfs cannot be maintained.

6. The USFS will record the date and the instream flow at which surface water diversions on Early Winters Creek are turned on and when flows are reduced or

discontinued for the season. Those records will be forwarded to NMFS, Washington State Habitat Branch in Olympia, Washington, prior to the end of each calendar year in which the ditch operates.

7. At the end of each irrigation season, the USFS will require Early Winters Ditch Company to submit a water use monitoring report that includes flow measurements collected at the headworks gauge at Early Winters Ditch and at the gauge at the State Route 20 crossing. The findings of that report will be forwarded to the National Marine Fisheries Service, Habitat Conservation Branch in Olympia, Washington, by the end of each calendar year in which the diversion operates.

8. The USFS will require Early Winters Ditch Company to continue flow studies on Early Winters Creek. The studies should include the following:

   a. An assessment of the streamflow hydrograph for multiple years.

   b. An assessment of the impacts of deep well water withdrawals on instream flows.

   c. An examination of a flow management strategy based on timing, rather than a static target flow amount, of when the creek becomes baseflow dominant, and identification of relevant triggers(s) for modifying diversions during the irrigation season.

IX. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat. The following are discretionary suggested actions that the USFS can implement in furtherance of its responsibilities under section 7(a)(1) of the ESA. The USFS should encourage Early Winters Ditch Company to take the following actions:

- For the year 2000 and beyond, a long-term monitoring plan should be developed to define and implement monitoring protocol for an adaptive management plan. By the year 2003, the permittee plans to develop and implement a final adaptive management operating plan.

- For the year 2000 and beyond, the permittee plans to continue performing snorkel surveys in Early Winters Creek to aid in correlating hydrological and habitat needs for resident

and anadromous fish species.

- The permittee intends to continue developing a plan that complies with the format and content requirements of a Habitat Conservation Plan (HCP), as provided under ESA section 10(a)(2)(A). An HCP would include commitments to complete ongoing flow studies for multiple irrigation seasons and to assess the effects of groundwater withdrawal on instream flows in Early Winters Creek.

X. REINITIATION OF CONSULTATION

Consultation must be reinitiated if: the amount of extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or, a new species is listed or critical habitat is designated that may be affected by the action (50 C.F.R § 402.16).

NMFS understands that Early Winters Ditch Company has developed a draft operational plan to repair the existing headgate, screen, and water delivery system. Once completed, the plan will also provide a detailed implementation scheme to increase the efficiency of the irrigation system and eliminate potential take of listed species. When completed, NMFS anticipates the USFS and the permittee will provide NMFS with the new (final) operational plan and request reinitiation of consultation if warranted.

NMFS has based its determination of ESA flow levels needed to avoid jeopardizing the listed species on the best available scientific information. New information on flow levels in the Methow Basin is being gathered, and NMFS encourages submission of additional scientific information to further define the variability of flows on Early Winters Creek and other Methow River tributaries. When this information becomes available, NMFS anticipates the USFS and the special use permittees will provide the new data to NMFS and contact NMFS to schedule meetings to analyze the new data. Reinitiation of this consultation to revise instream flow levels will be initiated if warranted by the new information. The NMFS is committed to meet with the USFS and the permittees at least once a month, starting in October 2000, to analyze data and possibly revise necessary instream flow levels before the beginning of the irrigation season in April 2001.

XI. REFERENCES

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Attachment 1. Upper Columbia River Steelhead: Biological Requirements and Status Under the Environmental Baseline

Attachment 2. Upper Columbia River Chinook Salmon: Biological Requirements and Status Under the Environmental Baseline

Attachment 3. The Habitat Approach: Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids